

PATENT ABSTRACTS OF JAPAN

(11)Publication number : 2002-217797

(43)Date of publication of application : 02.08.2002

(51)Int.CI.

H04B 3/54
H04L 25/02

(21)Application number : 2001-005616

(71)Applicant : SUMITOMO ELECTRIC IND LTD

(22)Date of filing : 12.01.2001

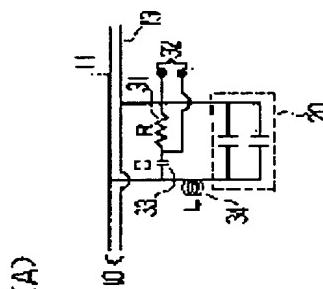
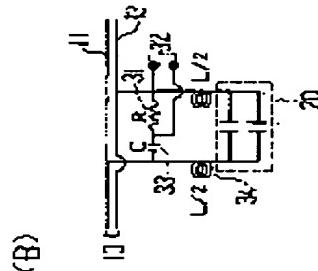
(72)Inventor : KUWABARA MASAHIRO

(54) COMMUNICATION LINE UTILIZING POWER DISTRIBUTION LINE

(57)Abstract:

PROBLEM TO BE SOLVED: To provide a communication line utilizing a power distribution line, an indoor power distribution line, a termination structure, a MODEM, a power receptacle and an adaptor that can eliminate the effect of an impedance loss by electric devices connected to the power distribution line and of noise generated by the electric devices in the case of carrying a communication signal by utilizing the power distribution line.

SOLUTION: The communication line utilizing the power distribution line is provided with an indoor power distribution line 10 on the electric power transmitted through which a high frequency signal is superimposed, and a termination structure formed at the termination of the power distribution line. The indoor power distribution line 10 consists of a conductor, an insulator, a shield layer and a sheath in this order from the inside. The termination structure has a resistor 31 whose resistance is substantially equal to the characteristic impedance of the power distribution line and also has a capacitor 33 connected in series with the resistor 31 and an inductor 34 that is connected between the power distribution line and a load. The power distribution line with the coaxial structure enhances noise immunity and the termination structure matches the impedance to prevent attenuation of the high frequency signal due to the reflection.



LEGAL STATUS

[Date of request for examination]

[Date of sending the examiner's decision of rejection]

[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]

[Date of final disposal for application]

[Patent number]

[Date of registration]

[Number of appeal against examiner's decision
of rejection]

[Date of requesting appeal against examiner's
decision of rejection]

[Date of extinction of right]

Copyright (C) 1998,2003 Japan Patent Office

*** NOTICES ***

JPO and NCIP are not responsible for any damages caused by the use of this translation.

1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. **** shows the word which can not be translated.
3. In the drawings, any words are not translated.

DETAILED DESCRIPTION

[Detailed Description of the Invention]**[0001]**

[Field of the Invention] This invention relates to the various devices which include termination structure in the communication line which used the power-source line, a power-source line, and a termination structure list.

[0002]

[Description of the Prior Art] Conventionally, signal transmission is transmitted using the electric-wire network which became independent of the distribution lines, such as the telephone line. Using power-source lines, such as the distribution line, and transmitting signal transmission in recent years for the simplification and the increase in efficiency of the communication service into a home or works, is studied. It can communicate by suppressing initial plant-and-equipment investment without constructing drawing in of a communication wire etc. by using a power-source line as the communication line. Although the communication link signal frequency band is regulated by 450kHz or less by Wireless Telegraph Law, as for the technique which superimposes signal transmission on a power-source line, use in a high frequency band (1MHz-) is expected more from now on, as for current.

[0003]

[Problem(s) to be Solved by the Invention] However, in order to perform a high-speed communication link using a high-frequency band using an indoor power-source line, it is necessary about the communication link property of a power-source track, i.e., the transmission characteristic of the power-source track itself, the terminator for RFs, etc. to make a property improvement. Specifically, the following technical problems occur.

[0004] ** On the conventional inside-of-a-house power-source track, the noise by induction is large. Generally parallel 2 line without a shielding layer which used the vinyl insulator is used for the indoor power-source line. When it is going to transmit the signal transmission of a RF to this power-source line, and there is no shielding layer, the noise by induction is large and a transmission characteristic deteriorates. Furthermore, transmission loss becomes large when the impedance of a track becomes large.

[0005] ** Attenuation of the signal accompanying phasing by reflection of the signal produced in a power-source track trailer is large. Usually, there is two or more branching of a domestic power-source line. If it is going to superimpose and transmit a RF signal (1MHz-) by such power-source line, reflection of a signal will be produced in a trailer by the difference in the magnitude of the impedance of a power-source track, and the input impedance of a household-electric-appliances device, and the signal of the specific frequency according to branching length will decline. Moreover, from there being two or more branching of a power-source line, two or more frequency bands to decrease are also produced, the frequency band which can transmit a signal becomes small, and transmission capacity falls.

[0006] Therefore, the key objective of this invention is in conveyance of the signal transmission which used the power-source line to offer the communication line using the power-source line which can lose the effect of the noise which the impedance loss and electrical machinery and apparatus by the electrical machinery and apparatus connected to a power-source line generate, an inside-of-a-house power-source line, termination structure, a modem, a plug socket, and an adapter.

[0007]

[Means for Solving the Problem] The communication line using the power-source line of this invention is the communication line using a power-source line equipped with the inside-of-a-house power-source line by which it is superimposed on a RF signal, and the termination structure connected to the branching trailer of this power-source line. Here, an inside-of-a-house power-source line is equipped with a conductor, an insulator, a shielding layer, and a sheath sequentially from the interior. Moreover, termination structure is characterized by having resistance of an equal value substantially with the characteristic impedance of said power-source line. By this resistance, matching of an impedance is taken at termination, reflection and attenuation of a RF signal are prevented, and the communication link of the RF signal using a power-source line is enabled.

[0008] Next, this invention inside-of-a-house power-source line is an inside-of-a-house power-source line by which it is superimposed on a RF signal, and is characterized by having a conductor, an insulator, a shielding layer, and a sheath sequentially from the interior. Effect of the noise by induction can be made hard to be influenced by considering as the power-source line of such coaxial structure.

[0009] To a conductor, a line or a braided wire is more desirable than that of copper or aluminum. A transfer of power sake -- the conductor of a power-source line -- a path -- the conductor of the usual coaxial cable for a communication link -- it is necessary to increase rather than a path (usually about 0.5-1mm) a conductor -- even if it enlarges a path, in order to maintain flexibility, twisted wire or braid lineation is desirable.

[0010] Polyethylene, cross-linked polyethylene, or polypropylene of an insulator is desirable. As coaxial structure, constituting an insulator from these ingredients makes an impedance small, and it is effective because of transmission loss reduction.

[0011] The wire, tape, or braided wire which consists of copper or aluminum can be used for a shielding layer. Effect of the noise by induction is made hard to be influenced by preparing a shielding layer.

[0012] A sheath is a thing for trauma protection and polyethylene, vinyl, polypropylene, etc. can be used for it.

[0013] This invention termination structure is termination structure connected to the branching trailer of the inside-of-a-house power-source line by which it is superimposed on a RF signal, and is characterized by having resistance of an equal value substantially with the characteristic impedance of said power-source line. By this resistance, matching of an impedance is taken at branching termination, reflection and attenuation of a RF signal are prevented, and the communication link of the RF signal using a power-source line is enabled.

[0014] A thing equipped with the inductance connected between the capacitor substantially connected with the characteristic impedance of said power-source line as a more concrete configuration of this termination structure at resistance of an equal value, resistance, and a serial, and a power-source line and a load is suitable. A capacitor is connected to a terminator and a serial in order to prevent the inflow of the commercial-frequency current from a power-source track to a communication link signal output part. Moreover, an inductance is connected in order to prevent the inflow of the RF signal current to a load, and an inflow on the power-source track of the noise by the side of a load.

[0015] This termination structure is using the electrical potential difference of the both ends of resistance as an I/O signal of signal transmission, and does not newly need to prepare the output port of signal transmission.

[0016] As for the above termination structure, it is desirable to form and use for the modem which is formed in a plug socket and which is formed in the adapter which can be freely detached and attached to a plug socket.

[0017]

[Embodiment of the Invention] Hereafter, the gestalt of operation of this invention is explained. (Coaxial power-source line) Drawing 1 is the cross-sectional view of this invention inside-of-a-house power-source line.

[0018] This power-source line 10 is an electric wire of the coaxial structure of superimposing and conveying RF signal transmission while performing the electric power supply of commercial

frequency, and it is equipped with the conductor 11, the insulator 12, the shielding layer 13, and the sheath 14 sequentially from the inside.

[0019] The line was used for the conductor 11 from copper. a transfer of power sake -- the need for the power-source line 10 -- a conductor -- securing a path, it considered as the conductor of twisted-wire structure so that the flexibility as a power-source line 10 could be maintained.

[0020] The insulator 12 used cross-linked polyethylene. The shielding layer 13 consisted of copper braided wires. Furthermore, the sheath 14 consisted of polyethylene.

[0021] By considering as the power-source line of such coaxial structure, effect of the noise by induction was made hard to be influenced, by specifying an insulator ingredient, the impedance was made small and reduction of transmission loss was aimed at.

[0022] (Plug socket with a matching circuit) Drawing 2 (A) is the outline block diagram of this invention termination structure which built the impedance matching circuit in the plug socket which is the branching termination of the track which used the above-mentioned power-source line 10. Usually, the indoor power-source line 10 has two or more branching, and the termination of each branching serves as a plug socket. The plug socket 20 is formed between the conductor 11 of a power-source line, and the shielding layer 13, and prepares an impedance matching circuit between this power-source line 10 and plug socket 20.

[0023] This matching circuit is equipped with the resistance 31 connected to the conductor 11 of a power-source line. The value of this resistance 31 is set up so that it may become equal substantially at the characteristic impedance of the power-source line 10. By this resistance 31, reflection and attenuation of a RF signal are prevented at branching termination, and the communication link of the RF signal using a power-source line is enabled. The both ends of resistance 31 are pulled out as the I/O section 32 of a RF signal, and the electrical potential difference produced here is used as an I/O signal of a RF signal.

[0024] Moreover, a capacitor 33 is connected to resistance 31 and a serial. A capacitor 33 prevents the inflow of the commercial-frequency current from a power-source track to a communication link signal output part.

[0025] Furthermore, the inductance 34 is formed between the conductor 11 of a power-source line, and the load (plug socket side). An inductance 34 prevents the inflow of the RF signal current to a load, and an inflow on the power-source track of the noise by the side of a load.

[0026] Here, the value of resistance:R, capacitor:C, and an inductance L is selected to the following values, in order to take adjustment of an impedance.

Characteristic-impedance ($C/2\pi f$) << $R(2\pi fL)$ >> $R*f$ of R** power-source track: Communication link frequency (it is lowest frequency when it superimposes many frequencies)

[0027] It is the outline block diagram of this invention track where drawing 2 (B) established the impedance matching circuit in the power-source line. The matching circuit shown in drawing 2 (B) is the same as the matching circuit of drawing 2 (A) except for the point which divides into two the inductance 34 prepared between a power-source line and a load. The same function as the matching circuit of drawing 2 (A) is achieved even in this matching circuit.

[0028] (Adapter with a matching circuit) If termination is performed by equipping with an adapter with an impedance matching circuit about an established power-source track and an established plug socket, the communication link by the RF signal can be performed like the above-mentioned plug socket with a matching circuit, without constructing also in an established power-source track. The adapter 40 shown in drawing 3 (A) and (B) equips an end with the attachment plug to a plug socket, and equips the other end with the opening of the plug of a household-electric-appliances device. The configuration of this matching circuit is the same as that of the matching circuit shown in drawing 2. That is, it has the resistance connected to the plug side to a plug socket. Moreover, Capacitor C is connected to Resistance R and a serial. And an inductance L is formed between loads a plug socket side. The value of R, C, and L is the same as that of a setup of the matching circuit shown in drawing 2. Moreover, the matching circuit shown in drawing 3 (B) is the same as the matching circuit of drawing 3 (A) except for the point which divides into two the inductance 34 prepared between a power-source line and a load.

[0029] (Modem) When communicating by the high frequency signal on which communication equipment, such as a computer and FAX, was superimposed by connecting with a power-source line,

an impedance matching circuit may be built in the modem itself. As mentioned above, although the high frequency communication link by the power-source line is possible also for using an adapter for ** plug socket which builds an impedance matching circuit in the ** plug socket itself, and post-installing an impedance matching circuit, the same effectiveness can be done so even if it builds the impedance matching circuit in the modem itself. The configuration of the matching circuit itself is the same as that of drawing 2 and the thing shown in 3, and is good.

[0030]

[Effect of the Invention] According to this invention, the following effectiveness can be done so as explained above.

[0031] this invention impedance matching circuit is preparing in the termination of the power-source line by which it is superimposed on a RF, attenuation of the signal transmission by reflection at termination can be prevented, and the high-speed communication link which used the high frequency band is attained.

[0032] this invention termination structure can prevent attenuation by reflection of signal transmission, when the communication link by the RF signal is performed using a power-source line by building a matching circuit in the modem itself which builds an impedance matching circuit in a plug socket and which post-installs the adapter which has a matching circuit in a plug socket.

[0033] this invention termination structure can communicate without establishing the track for signal transmission ejection, and output port newly.

[0034] According to this invention power line, by having used insulators, such as polyethylene and polypropylene, as coaxial structure, it excels in low loss and noise-proof nature, and can use to the communication link which superimposed the RF signal effectively.

[0035] In addition to noise-proof nature, the communication line equipped with this invention power-source line and this invention termination structure can prevent degradation of the transmission characteristic in a track, and the high-speed communication link which used the high frequency band as the communication line of a RF signal using the power-source line itself is attained.

[Translation done.]

*** NOTICES ***

JPO and NCIPI are not responsible for any damages caused by the use of this translation.

1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. **** shows the word which can not be translated.
3. In the drawings, any words are not translated.

CLAIMS

[Claim(s)]

[Claim 1] It is the communication line using the power-source line which is the communication line using a power-source line equipped with the inside-of-a-house power-source line by which it is superimposed on a RF signal, and the termination structure formed in the trailer of this power-source line, and said inside-of-a-house power-source line is equipped with a conductor, an insulator, a shielding layer, and a sheath sequentially from the interior, and is characterized by said termination structure having resistance of an equal value substantially with the characteristic impedance of said power-source line.

[Claim 2] The inside-of-a-house power-source line which is an inside-of-a-house power-source line by which it is superimposed on a RF signal, and is characterized by having a conductor, an insulator, a shielding layer, and a sheath sequentially from the interior.

[Claim 3] Termination structure which is the termination structure formed in the trailer of the inside-of-a-house power-source line by which it is superimposed on a RF signal, and is characterized by having resistance of an equal value substantially with the characteristic impedance of said power-source line.

[Claim 4] Termination structure according to claim 3 characterized by having the inductance connected between the capacitor connected to resistance and a serial, and a power-source line and a load.

[Claim 5] Termination structure according to claim 3 characterized by using the electrical potential difference of the both ends of resistance as an I/O signal of signal transmission.

[Claim 6] The modem characterized by having termination structure according to claim 3 or 4.

[Claim 7] The plug socket characterized by having termination structure according to claim 3 or 4.

[Claim 8] The termination adapter characterized by having termination structure according to claim 3 or 4.

[Translation done.]

*** NOTICES ***

JPO and NCIPI are not responsible for any
damages caused by the use of this translation.

1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. **** shows the word which can not be translated.
3. In the drawings, any words are not translated.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is the cross-sectional view of this invention power-source line.

[Drawing 2] It is the outline block diagram of this invention termination structure where (A) used the outline block diagram of this invention termination structure, and (B) used two inductances.

[Drawing 3] It is the outline block diagram of this invention adapter by which (A) used the outline block diagram of this invention adapter, and (B) used two inductances.

[Description of Notations]

10 Power-Source Line

11 Conductor

12 Insulator

13 Shielding Layer

14 Sheath

20 Plug Socket

31 Resistance

32 I/O Section

33 Capacitor

34 Inductance

40 Adapter

[Translation done.]

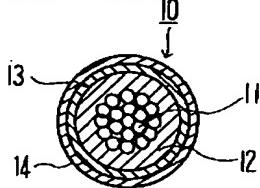
* NOTICES *

JPO and NCIP are not responsible for any damages caused by the use of this translation.

1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. **** shows the word which can not be translated.
3. In the drawings, any words are not translated.

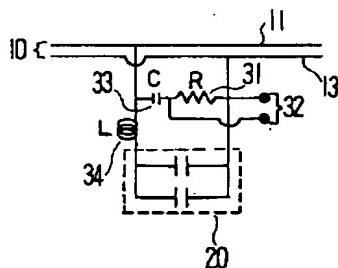
DRAWINGS

[Drawing 1]

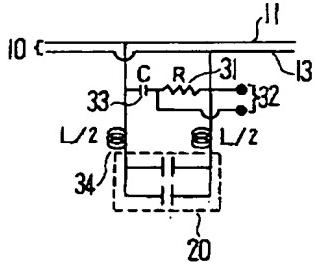


[Drawing 2]

(A)

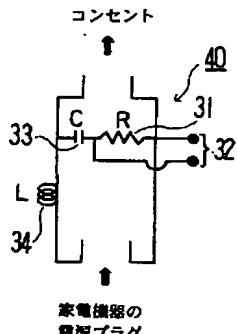


(B)

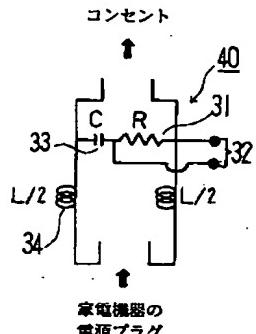


[Drawing 3]

(A)



(B)



[Translation done.]

(19)日本国特許庁 (JP)

(12) 公開特許公報 (A)

(11)特許出願公開番号

特開2002-217797

(P2002-217797A)

(43)公開日 平成14年8月2日 (2002.8.2)

(51)Int.Cl.
H 04 B 3/54
H 04 L 25/02

識別記号

F I
H 04 B 3/54
H 04 L 25/02

テ-マ-ト(参考)
5 K 0 2 9
F 5 K 0 4 6

審査請求 未請求 請求項の数8 OL (全 5 頁)

(21)出願番号 特願2001-5616(P2001-5616)

(22)出願日 平成13年1月12日 (2001.1.12)

(71)出願人 000002130
住友電気工業株式会社
大阪府大阪市中央区北浜四丁目5番33号

(72)発明者 桑原 雅裕
大阪市此花区島屋一丁目1番3号 住友電
気工業株式会社大阪製作所内

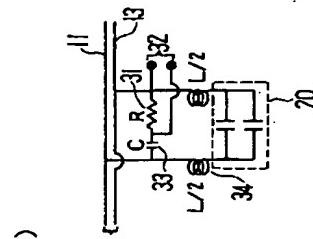
(74)代理人 100100147
弁理士 山野 宏 (外1名)
F ターム(参考) 5K029 AA03 CC01 JJ08 LL01
5K046 AA03 CC22 PS03

(54)【発明の名称】 電源線を用いた通信線路

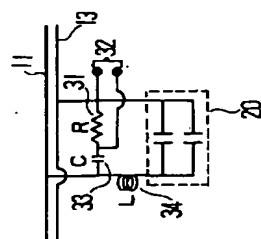
(57)【要約】

【課題】 電源線を用いた通信信号の搬送において、電源線に接続される電気機器によるインピーダンスロス及び電気機器が発生するノイズの影響をなくすことができる電源線を用いた通信線路、屋内電源線、終端構造、モデム、コンセントおよびアダプタを提供する。

【解決手段】 高周波信号が重畠される屋内電源線10と、この電源線の終端部に形成される終端構造とを備える。この屋内電源線10は、内部から順に導体、絶縁体、遮蔽層およびシースを備える。終端構造は、電源線の特性インピーダンスと実質的に等しい値の抵抗31を有する。さらに抵抗31と直列に接続されるコンデンサ33と、電源線と負荷との間に接続されるインダクタンス34とを備える。同軸構造の電源線により耐ノイズ性を高め、上記終端構造でインピーダンスのマッチングをとて高周波信号の反射に伴う減衰を防止する。



(B)



(A)

【特許請求の範囲】

【請求項1】 高周波信号が重畠される屋内電源線と、この電源線の終端部に形成される終端構造とを具える電源線を用いた通信線路であって、

前記屋内電源線は、内部から順に導体、絶縁体、遮蔽層およびシースを具え、前記終端構造は、前記電源線の特性インピーダンスと実質的に等しい値の抵抗を有することを特徴とする電源線を用いた通信線路。

【請求項2】 高周波信号が重畠される屋内電源線であって、内部から順に導体、絶縁体、遮蔽層およびシースを具えることを特徴とする屋内電源線。

【請求項3】 高周波信号が重畠される屋内電源線の終端部に形成される終端構造であって、前記電源線の特性インピーダンスと実質的に等しい値の抵抗を有することを特徴とする終端構造。

【請求項4】 抵抗と直列に接続されるコンデンサと、電源線と負荷との間に接続されるインダクタンスとを具えることを特徴とする請求項3に記載の終端構造。

【請求項5】 抵抗の両端の電圧を通信信号の入出力信号として用いることを特徴とする請求項3に記載の終端構造。

【請求項6】 請求項3または4に記載の終端構造を具えることを特徴とするモジュール。

【請求項7】 請求項3または4に記載の終端構造を具えることを特徴とするコンセント。

【請求項8】 請求項3または4に記載の終端構造を具えることを特徴とする終端アダプタ。

【発明の詳細な説明】

【0001】

【発明の属する技術分野】 本発明は、電源線を用いた通信線路、電源線、終端構造並びに終端構造を含む各種機器に関するものである。

【0002】

【従来の技術】 従来、通信信号は、例えば電話線など、配電線とは独立した電線網を用いて伝送されている。近年、家庭や工場内への通信サービスの簡素化・効率化のために、配電線等の電源線を用いて通信信号を伝送することが研究されている。電源線を通信線路として使用することにより、通信線の引き込みなどの工事を行わないで、初期設備投資を抑えて通信を行うことができる。電源線に通信信号を重畠する技術は、現在は電波法により通信信号周波数帯域が450kHz以下に規制されているものの、今後はより高周波帯域(1MHz～)での利用が期待されている。

【0003】

【発明が解決しようとする課題】 しかし、屋内の電源線を用いて高周波数帯域を利用して高速通信を行うには、電源線路の通信特性、すなわち電源線路自体の伝送特性、高周波用の終端抵抗などに関して、特性改善を行う必要がある。具体的には、次のような課題がある。

【0004】 ①従来の屋内電源線では誘導によるノイズが大きい。一般に屋内の電源線には、ビニル絶縁体を用いた遮蔽層なしの平行2線が用いられている。この電源線に高周波の通信信号を伝送しようとした場合、遮蔽層がないことによって誘導によるノイズが大きく、伝送特性が劣化する。さらに、線路のインピーダンスが大きくなることにより、伝送損失が大きくなる。

【0005】 ②電源線路終端部で生じる信号の反射によるフェージングに伴う信号の減衰が大きい。通常、家庭内の電源線の分歧は複数個所ある。このような電源線で高周波信号(1MHz～)を重畠して伝送しようとすると、電源線路のインピーダンスと家電機器の入力インピーダンスの大きさの違いにより終端部で信号の反射を生じ、分歧長に応じた特定周波数の信号が減衰する。また、電源線の分歧が複数個所あることから、減衰する周波数帯も複数箇所生じ、信号の伝送が可能な周波数帯域が小さくなつて伝送容量が低下する。

【0006】 従つて、本発明の主目的は、電源線を用いた通信信号の搬送において、電源線に接続される電気機器によるインピーダンスロス及び電気機器が発生するノイズの影響をなくすことができる電源線を用いた通信線路、屋内電源線、終端構造、モジュール、コンセントおよびアダプタを提供することにある。

【0007】

【課題を解決するための手段】 本発明の電源線を用いた通信線路は、高周波信号が重畠される屋内電源線と、この電源線の分歧終端部に接続される終端構造とを具える電源線を用いた通信線路である。ここで、屋内電源線は、内部から順に導体、絶縁体、遮蔽層およびシースを具える。また、終端構造は、前記電源線の特性インピーダンスと実質的に等しい値の抵抗を有することを特徴とする。この抵抗により、終端でインピーダンスのマッチングをとつて高周波信号の反射・減衰を防止し、電源線を用いた高周波信号の通信を可能にする。

【0008】 次に、本発明屋内電源線は、高周波信号が重畠される屋内電源線であって、内部から順に導体、絶縁体、遮蔽層およびシースを具えることを特徴とする。このような同軸構造の電源線とすることで、誘導によるノイズの影響を受けにくくすることができる。

【0009】 導体には、銅またはアルミのより線または編組線が好ましい。電力伝送のために、電源線の導体径は、通常の通信用同軸ケーブルの導体径(通常0.5～1mm程度)よりも増大する必要がある。導体径を大きくしても可撓性を維持するには、より線または編組線構造が好ましい。

【0010】 絶縁体は、ポリエチレン、架橋ポリエチレンまたはポリプロピレンが好ましい。同軸構造として、これらの材料で絶縁体を構成することはインピーダンスを小さくして伝送損失低減のために有効である。

【0011】 遮蔽層には、銅またはアルミからなるワイ

ヤー、テープまたは編組線が利用できる。遮蔽層を設けることで、誘導によるノイズの影響を受けにくくする。【0012】シースは、外傷保護のためのものであり、ポリエチレン、ビニル、ポリプロピレンなどが利用できる。

【0013】本発明終端構造は、高周波信号が重畠される屋内電源線の分岐終端部に接続される終端構造であって、前記電源線の特性インピーダンスと実質的に等しい値の抵抗を有することを特徴とする。この抵抗により、分岐終端でインピーダンスのマッチングをとって高周波信号の反射・減衰を防止し、電源線を用いた高周波信号の通信を可能にする。

【0014】この終端構造のより具体的な構成としては、前記電源線の特性インピーダンスと実質的に等しい値の抵抗と、抵抗と直列に接続されるコンデンサと、電源線と負荷との間に接続されるインダクタンスとを具えるものが好適である。電源線路から通信信号出力部への商用周波電流の流入を防ぐために、終端抵抗と直列にコンデンサを接続する。また、負荷への高周波信号電流の流入および負荷側のノイズの電源線路への流入を防止するためにインダクタンスを接続する。

【0015】この終端構造は、抵抗の両端の電圧を通信信号の入出力信号として用いることで、通信信号の取り出しが新たに設ける必要がない。

【0016】以上の終端構造は、コンセントに形成する、コンセントに着脱自在のアダプタに形成する、モジュに形成するなどして利用することが望ましい。

【0017】

【発明の実施の形態】以下、本発明の実施の形態を説明する。

(同軸電源線) 図1は本発明屋内電源線の横断面図である。

【0018】この電源線10は、商用周波数の電力供給を行うと共に高周波通信信号を重畠して搬送する同軸構造の電線で、内側から順に、導体11、絶縁体12、遮蔽層13、シース14を具えている。

【0019】導体11には銅より線を用いた。電力伝送のために、電源線10の必要導体径を確保しながら、電源線10としての可携性を維持できるようにより線構造の導体とした。

【0020】絶縁体12は架橋ポリエチレンを用いた。遮蔽層13は銅の編組線で構成した。さらに、シース14はポリエチレンで構成した。

【0021】このような同軸構造の電源線とすることで、誘導によるノイズの影響を受けにくくし、絶縁体材料を特定することで、インピーダンスを小さくして伝送損失の低減を図った。

【0022】(整合回路付きコンセント) 図2(A)は上記電源線10を用いた線路の分岐終端であるコンセントにインピーダンス整合回路を内蔵した本発明終端構造の

概略構成図である。通常、屋内の電源線10は複数の分岐を有し、各分岐の終端がコンセントとなっている。コンセント20は電源線の導体11と遮蔽層13との間に形成されており、この電源線10とコンセント20との間にインピーダンス整合回路を設ける。

【0023】この整合回路は、電源線の導体11に接続された抵抗31を具える。この抵抗31の値は、電源線10の特性インピーダンスに実質的に等しくなるように設定する。この抵抗31により、分岐終端で高周波信号の反射・減衰を防止し、電源線を用いた高周波信号の通信を可能にする。抵抗31の両端を高周波信号の入出力部32として引出し、ここに生じる電圧を高周波信号の入出力信号として利用する。

【0024】また、抵抗31と直列にコンデンサ33を接続する。コンデンサ33は、電源線路から通信信号出力部への商用周波電流の流入を防ぐ。

【0025】さらに、電源線の導体11と負荷(コンセント側)との間にインダクタンス34が設けられている。インダクタンス34は、負荷への高周波信号電流の流入および負荷側のノイズの電源線路への流入を防止する。

【0026】ここで、抵抗:R、コンデンサ:C、インダクタンス:Lの値は、インピーダンスの整合を取るために以下の値を選定する。

R=電源線路の特性インピーダンス

$$(C/2\pi f) \ll R$$

$$(2\pi fL) \gg R$$

※f: 通信周波数(多数の周波数を重畠する場合は最低周波数)

【0027】図2(B)も電源線にインピーダンス整合回路を設けた本発明線路の概略構成図である。図2(B)に示す整合回路は、電源線と負荷との間に設けるインダクタンス34を2つに分けている点を除いて図2(A)の整合回路と同様である。この整合回路でも図2(A)の整合回路と同様の機能を果たす。

【0028】(整合回路付きアダプタ)既設の電源線路及びコンセントに関しては、インピーダンス整合回路付きのアダプタを装着することにより終端を行えば、既設電源線路においても工事を行うことなく前述の整合回路付きコンセントと同様に高周波信号による通信が行える。図3(A),(B)に示すアダプタ40は、一端にコンセントへの差し込みプラグを、他端に家電機器の電源プラグの差し込み口を具える。この整合回路の構成は図2に示した整合回路と同様である。すなわち、コンセントへのプラグ側に接続された抵抗を具える。また、抵抗Rと直列にコンデンサCを接続する。そして、コンセント側と負荷との間にインダクタンスLを設ける。R、C、Lの値は、図2に示す整合回路の設定と同様である。また、図3(B)に示す整合回路は、電源線と負荷との間に設けるインダクタンス34を2つに分けている点を除いて図3(A)の整合回路と同様である。

【0029】(モデム)コンピュータやFAXなどの通信機器を電源線に接続して重畠された高周波信号にて通信を行う場合、モデム自体にインピーダンス整合回路を内蔵しても良い。前述のように、①コンセント自体にインピーダンス整合回路を内蔵する、②コンセントにアダプタを用いてインピーダンス整合回路を後付けすることでも電源線による高周波通信が可能であるが、モデム自体にインピーダンス整合回路を内蔵しておいても同様の効果を奏すことができる。整合回路自体の構成は、図2、3に示したものと同様で良い。

【0030】

【発明の効果】以上説明したように、本発明によれば次の効果を奏すことができる。

【0031】本発明インピーダンス整合回路は、高周波の重畠される電源線の終端に設けることで、終端での反射による通信信号の減衰を防止でき、高周波帯域を使用した高速通信が可能になる。

【0032】本発明終端構造は、インピーダンス整合回路をコンセントに内蔵する、整合回路を有するアダプタをコンセントに後付けする、モデム自体に整合回路を内蔵することにより、電源線を用いて高周波信号による通信を行った場合、通信信号の反射による減衰を防止することができる。

【0033】本発明終端構造は、通信信号取り出し用の線路、取り出し口を新設することなく通信を行うことができる。

【0034】本発明電力線によれば、同軸構造としてボリエチレン、ポリプロピレンなどの絶縁体を用いたこと*

*で、低損失、耐ノイズ性に優れ、高周波信号を重畠した通信に効果的に利用できる。

【0035】本発明電源線と本発明終端構造とを組む通信線路は、耐ノイズ性に加えて線路での伝送特性の劣化を防止でき、電源線自体を高周波信号の通信線路として利用して高周波帯域を使用した高速通信が可能になる。

【図面の簡単な説明】

【図1】本発明電源線の横断面図である。

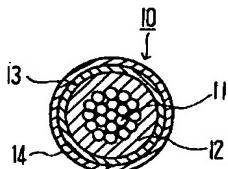
10 【図2】(A)は本発明終端構造の概略構成図、(B)はインダクタンスを2つ用いた本発明終端構造の概略構成図である。

【図3】(A)は本発明アダプタの概略構成図、(B)はインダクタンスを2つ用いた本発明アダプタの概略構成図である。

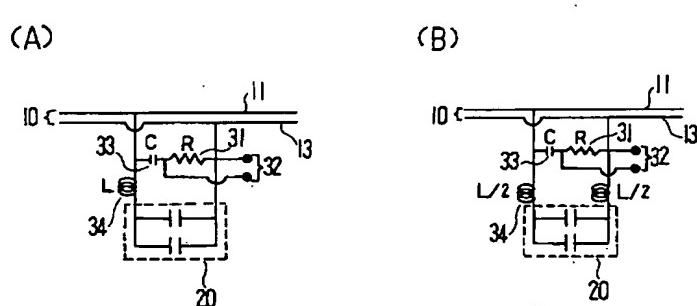
【符号の説明】

- | | |
|----|---------|
| 10 | 電源線 |
| 11 | 導体 |
| 12 | 絶縁体 |
| 20 | 遮蔽層 |
| 13 | シース |
| 20 | コンセント |
| 31 | 抵抗 |
| 32 | 入出力部 |
| 33 | コンデンサ |
| 34 | インダクタンス |
| 40 | アダプタ |

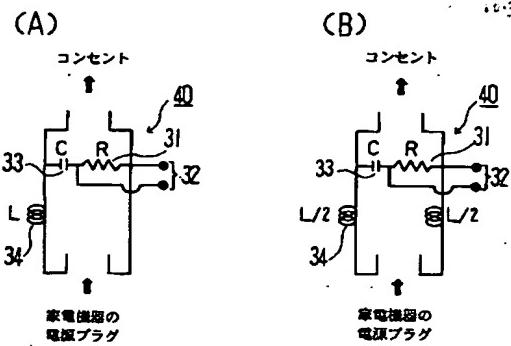
【図1】



【図2】



[図3]



This Page is inserted by IFW Indexing and Scanning
Operations and is not part of the Official Record

BEST AVAILABLE IMAGES

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images include but are not limited to the items checked:

- BLACK BORDERS
- IMAGE CUT OFF AT TOP, BOTTOM OR SIDES
- FADED TEXT OR DRAWING
- BLURED OR ILLEGIBLE TEXT OR DRAWING
- SKEWED/SLANTED IMAGES
- COLORED OR BLACK AND WHITE PHOTOGRAPHS
- GRAY SCALE DOCUMENTS
- LINES OR MARKS ON ORIGINAL DOCUMENT
- REPERENCE(S) OR EXHIBIT(S) SUBMITTED ARE POOR QUALITY
- OTHER: _____

**IMAGES ARE BEST AVAILABLE COPY.
As rescanning documents *will not* correct images
problems checked, please do not report the
problems to the IFW Image Problem Mailbox**